

Engineering & Computer Science

BITS

FACULTY NEWSLETTER ♦ SEPTEMBER/ OCTOBER 1996 ♦ VOLUME 4/ NUMBER 1

Computer Animation comes to Concordia

Computer Science and Fine Arts collaborate on unique inter-Faculty program

In an attempt to meet the growing industry need for experts in the ever-expanding multimedia field, the Department of Computer Science and the Faculty of Fine Arts at Concordia have developed an inter-Faculty program geared towards providing students with an understanding of the scientific aspects of computing complemented by an appreciation of the aesthetic aspects of digital imagery and sound.

This program, leading to a Major in Digital Image/Sound and the Fine Arts, requires completion of 45 credits in Computer Science and 45 credits in Fine Arts and is the first inter-Faculty degree offered at Concordia. Moreover, it is also the only program of its kind in Canada.

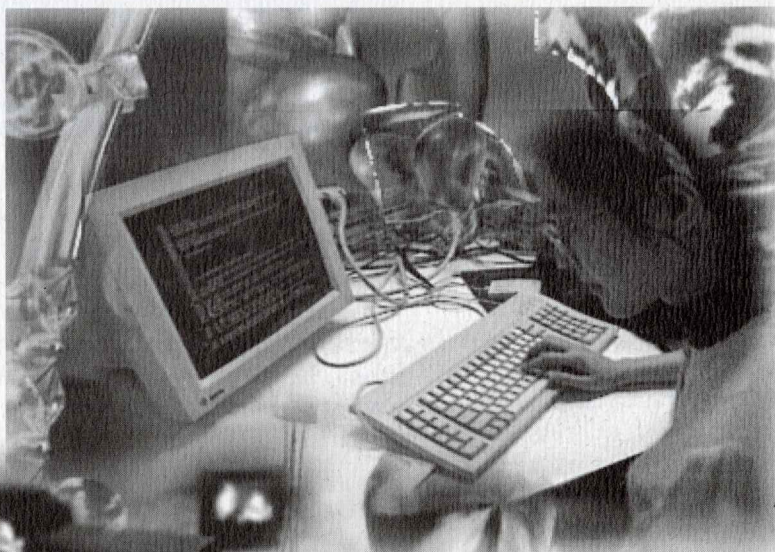
According to Dr. Clement Lam, Chair of the Department of Computer Science, students will also be able to choose from two other options. The first option allows students to pursue a Major in Fine Arts (66 credits) and a minor in Computer Science (24 credits) whereas the other allows them to complete a Major in Computer Science (60 credits) and a minor in Fine Arts (30 credits).

In a recent article published in the Montreal Hour, Greg Garvey, Chair of Concordia's Design Arts Department, stated that multimedia lies at the intersection of hypertext, audio, computer science, graphics and typography and that there is a need to refit the fine arts for the new technological era.

This program will hopefully do just that and help create individuals who have both solid computer skills and technological know-how accompanied by strong artistic talent.

According to Dr. Lam, after having assessed the needs of computer graphics companies in the Montreal-area, there is a distinct need for individuals in the field who possess a variety of talents and aptitudes. As such, students wishing to apply for the program will be required to develop a portfolio for Fine Arts and possess strong math marks for Computer Science.

Garvey stated that the industry need for this new kind of worker stems directly from the multimedia boom



our society is now experiencing. With companies such as SoftImage, CAE and Discreet Logic, Montreal industry should provide ample opportunity for graduates in the field.

This inter-Faculty collaboration is virtually uncharted territory for the University and hopefully will trailblaze for other Concordia programs to follow in the near future.

Amidst heavy cutbacks across the University, \$500,000 has been allocated to this programme for equipment and set-up costs, with one third of the funding coming from Concordia and the other two thirds from both Computer Science and Fine Arts.

The program is scheduled to begin in September 1997 with student applications being received no later than March 1, 1996.

Student enrolment for the first year will be limited to 25 students. Those wishing to apply should develop a portfolio consisting of visual work (on slides) and/or a video or sound project and possess strong math grades in order to deal with the computer science component of the degree.

For further information regarding the Computer Animation program please contact Dr. Clement Lam at (514) 848-3002 or via e-mail at lam@cs.concordia.ca

Dr. Mamdouh El-Badry Appointed Project Leader with ISIS Canada

Project focusses on revolutionizing construction and monitoring of innovative structures

In January 1996, Dr. Mamdouh El-Badry, from the Department of Civil Engineering, was appointed project leader within the Canadian Network of Centres of Excellence on Intelligent Sensing for Innovative Structures (ISIS Canada).

ISIS Canada, established in September 1995 and headquartered at the University of Manitoba, represents a collaborative effort linking 11 Canadian universities and over 75 researchers with public and private sector organizations involved in innovative design and construction technologies.

ISIS Canada supports five distinct research areas called themes which in turn house specific projects. Dr. El-Badry and his team are specifically involved with the development of innovative structures that achieve superior performance through the use of advanced composite materials and integrated fibre optic structural sensing systems.

Many bridges and structures we see today are composed of concrete and steel components. Dr. El-Badry's research focuses on using advanced composite materials such as glass-fibre and carbon-fibre reinforced plastic sheets and reinforcing bars and prestressing cables to replace contemporary materials which are prone to corrosion and are less durable.

The non-corrosive nature of such structures in addition to their high strength-to-weight ratio and good fatigue properties would provide an excellent solution to the deterioration of existing concrete structures due to the corrosion of their steel components. This inevitably will increase their service life and help reduce long-term maintenance costs.

Although these new materials are slightly more expensive than their conventional counterparts, which results in higher start-up costs, inevitably the reduced amount of maintenance required for these structures will result in overall cost reduction.

These structures of the future would also be equipped with high-technology remote fibre sensors located throughout their infrastructure to help monitor their integrity. Presently the only means of identifying deterioration in bridges and structures is through field inspection and testing which require costly visits. Unlike aircraft and vehicles, which are maintained and serviced



The new Confederation Bridge, linking P.E.I. with New Brunswick, will be outfitted with a fibre optic structural sensing system to monitor its condition and performance.

daily, bridges are often built and then inspected less frequently which can give rise to the development of unnoticed problems. These innovative structures will be classified as "smart" by virtue of these integrated fibre optic structural sensing systems which allow their condition to be monitored from a central station through telephone lines or satellite links.

This four-year research project not only examines the use of these new materials as well as the incorporation of the previously mentioned sensors but, according to Dr. El-Badry, also looks at their effectiveness, specifically when subjected to severe environmental conditions such as cold weather and temperature variations.

The final goal of the project is to apply research to field applications either through the rehabilitation of existing structures or the development of new bridges built entirely from these revolutionary materials. Fibre optic sensors will also be integrated into new bridges as well, whether or not they are made of advanced composite materials.

As it stands, research has already started to be applied in various forms across Canada. The ClearWater Bridge in Alberta is being rehabilitated with carbon fibre reinforced plastic sheets. A portion of the Headingley Bridge in Manitoba is being reinforced with advanced composite materials and is also being equipped with fibre optic sensors. The Confederation Bridge linking P.E.I. and New Brunswick, where Dr. El-Badry is also involved in an NSERC-funded collaborative R&D program, is being instrumented with

integrated fibre optic sensors and deteriorating concrete columns at the Université de Sherbrooke were strengthened and protected by a high-strength wrap of fibre reinforced plastic.

Both Canadian and Japanese Industry have helped collaborate in this venture with such companies as Mitsubishi and Tokyo Rope from Japan and Pulltrall and Roctest from Canada playing active parts in this research initiative.

The project is ongoing and, as Dr. El-Badry points out, is renewable upon its four-year resolution. ISIS technology is vital in developing new opportunities for improving infrastructure building, renewal and maintenance and eventually will help provide solutions to the global infrastructure crisis in Canada.

NEXT ISSUE...

For the first time Concordia University has been selected to host the 1998 Quebec Engineering Games in which engineering students from nine Quebec universities will participate in a variety of academic activities, sporting events and debates. Created in 1990 at université de Laval, with the help of la commission des facultés d'ingénierie du Québec (CoFIQ), this initiative has grown each year and is now in its seventh year of operation. This major announcement will be highlighted in the next issue of BITS.

Collaborative projects initiated between Faculty and Southeast Asia

Dean Taddeo visits universities in Vietnam, Hong Kong and China

In an effort to help enhance the visibility and presence of Concordia University in the Far East and promote the Faculty's programs and research expertise, Dean Donat J. Taddeo from the Faculty of Engineering and Computer Science travelled to both Vietnam, China and Hong Kong in late August, 1996.

The Dean specifically visited Ho Chi Minh City University in Vietnam, where he was accompanied by Dr. K. Ha-Huy from the Centre for Building Studies, and then to Southeast University in Nanjing China, accompanied by Dr. A.A. Bulgaak from the Department of Mechanical Engineering. Both trips were aimed at continuing discussions on upcoming collaborative projects.

Vietnam

Three official discussions and information exchange meetings with officials from Ho Chi Minh City University (HUT) took place as well as tours of their laboratories and general academic facilities. HUT has given its fullest support to the submission of a project proposal with Concordia University to the Canadian International Development Agency (CIDA) in the areas of building and civil engineering.

HUT's areas of interest for the Faculty were primarily in these fields. There appears to be ample opportunity since the country itself is undergoing major construction as Vietnam moves towards a "market economy".

HUT believes a collaborative project with Concordia would be critical to train its professors in modern building and infrastructure techniques. These professors, in turn, would then pass their expertise on to their students as well as to the local industries in Vietnam.

There was serious demand expressed by HUT for the acquisition or purchase of equipment through the project proposal as the University is in need of modern equipment.

Dean Taddeo strongly believes that the success of the proposal hinges on the need to train HUT professors with the appropriate technologies and that training should focus on typically Vietnamese problems

faced in building and construction. To this end, he suggests it would be useful to include Canadian consulting engineering firms such as SNC Lavalin in the training process, since they have conducted projects in Vietnam in the past.

The proposal has received full support from Vietnam's Deputy Minister of Education and Training, Professor Tran Chin Dao. His Ministry's collaboration is critical in terms of Vietnamese government support for the project.

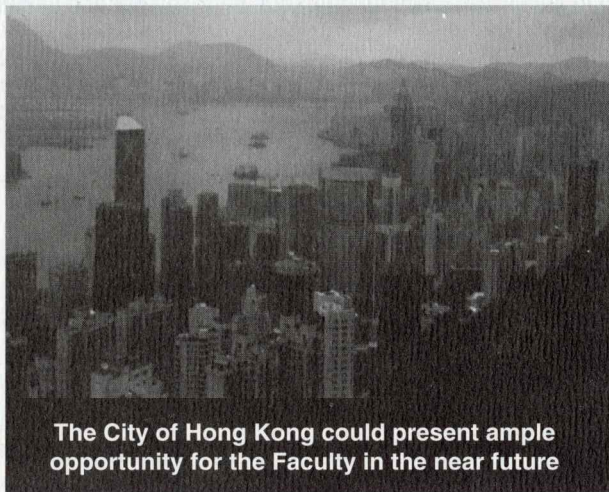
According to the Dean, the next stage will entail developing contacts with the Association of Universities and Colleges of Canada (AUCC) and CIDA, the Vietnamese Embassy in Ottawa as well as le Ministère des relations internationales du Québec.



(right to left) Dr. K. Ha-Huy, Dean D.J. Taddeo, the Vice-Rector from Ho Chi Minh University and Mr. N.Nguyen, President of NDV Corporation, sign agreement of cooperation.

China

Both Concordia and Southeast University were recently awarded an AUCC/CIDA project and discussions were held regarding its implementation. Among topics discussed were the need to designate Concordia faculty members and Canadian industry representatives who will be directly involved in the project. As well, the research areas and training facilities which will be used must be identified. In terms of equipment purchase, a final and approved budget of \$80,000 was established over a four-year period. South-



The City of Hong Kong could present ample opportunity for the Faculty in the near future

east University has requested that the amount be used for the purchase of equipment in the area of flexible manufacturing.

All seems in place for the full implementation of this project. Both Universities have agreed to take all steps necessary to ensure a most successful outcome.

Hong Kong

In addition to these two visits, Dean Taddeo spent the first three days of his trip visiting with Concordia alumni in Hong Kong and also toured the facilities of Hong Kong City University and the University of Science and Technology.

Working in the private, public and academic sectors, our alumni have their feet solidly on the ground and expressed a willingness to help Concordia as best they can.

There are approximately 400 registered members of the Hong Kong Alumni Chapter. Many of them are working in the construction industry, an area along with civil engineering which appears to be booming in Hong Kong.

Given the expertise of the Faculty in the area of building and civil engineering, accompanied by the strong representation of alumni in these related fields, should provide the Faculty with ample opportunity for the recruitment of new students and will also help strengthen Concordia's presence in Hong Kong.

Faculty Active on the Conference Circuit

Faculty helped organize several conferences in Montreal and overseas this past summer

The Faculty was extremely busy over the summer months as it was directly involved in four conferences and one lecture series. These initiatives helped promote the Faculty and its research centres and strengthened ties, both nationally and internationally, with specialists and experts in various engineering fields from across Canada and around the world.

Second International Conference on Advanced Composite Materials in Bridges and Structures



Dr. M. El-Badry from the Dept. of Civil Engineering (third from left) helped organize the 2nd International Conference on Advanced Composite Materials in Bridges & Structures

In August 1996, the Department of Civil Engineering hosted the Second International Conference on Advanced Composite Materials in bridges and structures (ACMBS-II).

The conference, co-organized by Dr. M. El-Badry, provided a forum for approximately 275 delegates from academic, research and industrial institutions from over 25 countries to exchange views on recent developments in the field of advanced composite materials in bridges and other structures. The 119 papers included in the conference proceedings review represent an overview of the state-of-the-art in this rapidly developing field.

The event was a collaborative effort between Concordia's Civil Engineering experts and six other Canadian universities and was sponsored by the Canadian Society for Civil Engineering, ACMBS Network and the Canadian Network of Centres of Excellence on Intelligent Sensing for Innovative Structures (ISIS Canada).

Third Canadian Conference on Computing in Civil and Building Engineering

This conference, also held in August 1996, was hosted by Concordia's Centre for Building Studies and co-organized by Drs. O. Moselhi, C. Bédard and S. Alkass from CBS. The conference provided a forum for presenting and discussing state-of-the-art developments in all fields of civil and building engineering from industry and academia. Topics of discussion ranged from building

energy management to computer graphics and simulations and covered a wide-spectrum of other fields.

The 27th VKI Computational Fluid Dynamics Lecture Series

For the first time the von Karman Institute's Lecture Series in Computational Fluid Dynamics was held in North America and was hosted by Concordia's Computational Fluid Dynamics Laboratory (CFD) under the direction of Dr. W.G. Habashi. The aim of this week-long lecture series was to provide in-depth presentations on well-established methods and on recent advances in the field of numerical flow

simulation. Guest lecturers included specialists from the U.S., Israel, Germany, Canada, Belgium and the Netherlands.

Joint Canada-Japan Workshop on Composites

In August 1996, Concordia's Centre for Composites, under the direction of Dr. S.V. Hoa, helped co-organize and sponsor an international workshop aimed at fostering partnerships between scientists and engineers in Canada and Japan and to provide a forum for the exchange of information and ideas on the study of composites. A total of 85 researchers including 11 from Canada participated in this event and potential collaborative projects were initiated between Canadian representatives and Japanese Industry. The next workshop is scheduled to take place in Montreal in 1998.

13th International Symposium on Automation and Robotics in Construction

In June 1996, Dr. O. Moselhi from the Centre for Building Studies co-organized an International Symposium on Automation and Robotics in the field of construction engineering. Held in Tokyo, Japan this conference featured researchers from over 12 different countries. The symposium provided the opportunity for members of industry and academia to exchange ideas and discuss the most recent developments in the field.

For further information regarding these conferences, lectures and workshops please contact the Communications Office of the Faculty of Engineering and Computer Science at (514) 848-3073 or via e-mail at mike@encs.concordia.ca

Robotics specialist helping revolutionize robot manipulator technology

Dr. Rajnikant. Patel, professor in the Department of Electrical and Computer Engineering at Concordia University, is helping contribute to the creation of the next generation of robot manipulators. His research will have a significant impact on the entire robotics industry, ranging from the performance of robots on production lines to the creation of a more advanced space arm for the upcoming international space station.

Specifically Dr. Patel is conducting research in the area of control systems and robotics. Control systems relating to robot manipulators focus primarily on the specific movements of robot arms and how they handle and manipulate parts on an assembly line. These new robot manipulators will have improved motion dexterity and thus be capable of performing a wider range of tasks.

In terms of the automated production line, the benefits of improved manipulator dexterity are tremendous in that they would also help improve the flexibility of the entire manufacturing line itself. Presently conventional production lines are geared towards producing specific kinds of parts. However, if changes are made in these parts, in terms of design, plants must be shut down for some time in order to physically rearrange the various sections of the production line to compensate for these changes. By improving manipulator dexterity, robots could be reprogrammed and have their movements altered to accommodate new parts without having to physically move elements of the production line to avoid manipulators from running into one another, or into objects in their work area.

One related project involving Dr. Patel and supported by the Institute for Robotics and Intelligent Systems (one of the National Networks of Centres for Excellence) deals with the development of a flexible multi-purpose manufacturing line which would contain dextrous robot manipulators. As principal investigator, Dr. Patel is focusing on the development of 3-D graphics software which would interface with the robots and regulate their motion and allow

them to be easily reprogrammed if their movements need to be altered.

Dr. Patel is also involved in a project funded by the Canadian Space Agency (CSA) in collaboration with Bombardier which focuses on the development of methodologies for using dextrous manipulators in space. Using robot arms at Concordia as a test bed, Dr. Patel and his team are developing methodologies for the creation of the hardware, software and real-time control for this project. The CSA and Bombardier, in turn, would then use this information and incorporate it into some of their existing projects.

Based on this project Dr. Patel has also obtained an NSERC Collaborative Research and Development Grant jointly with a researcher at McGill, which is being used to construct one of two robot arms here at Concordia.

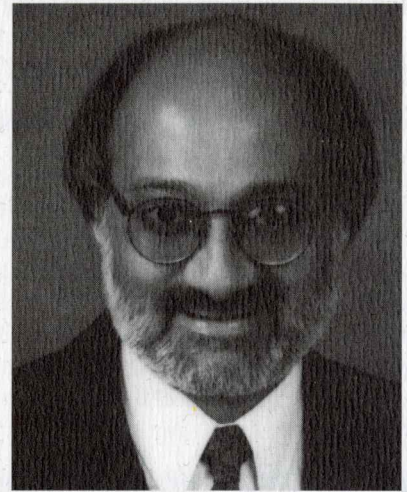
He also heads one of the top-rated FCAR teams in Quebec (based on the 1993-94 competition). The team consists of his departmental colleagues Dr. Khorasani and Dr. Al-Khalili, as well as a researcher from Hydro-Québec (Dr. Sood). A research project funded by the FCAR grant focusses on the use of intelligent control systems in improving the performance of power transmission systems.

Dr. Patel first joined Concordia in 1981 and has just recently returned after taking a year's leave of absence. Besides his research Dr. Patel teaches courses in the areas of robotics, control systems, neural networks and optimization theory.

Born in Kenya, Dr. Patel received his Bachelor's degree in Engineering from the University of Liverpool in England and then went on to complete his Ph.D. at Cambridge where he specialized in control systems.

Dr. Patel completed a post-doctoral fellowship at Cambridge before leaving for California where he worked at NASA's Ames Research Centre for two years on a National Research Council post-doctoral fellowship. His work focused on control problems related to short take-off and landing aircraft.

Prior to joining Concordia, Dr. Patel held a full-time academic appointment at the University of Manchester Institute of Science and Technology in England.



External Advisory Board helps establish Student Internships

The Faculty's success at forging stronger links with Industry was illustrated as five students from the Department of Mechanical Engineering obtained full-year internships with Pratt & Whitney, Rolls Royce Canada and Bombardier Inc., Canadair.

These paid internships, which began during the summer of 1996, were the first awarded for the entire Faculty and were created thanks to collaborative efforts between the Faculty and members of its External Advisory Board.

The External Advisory Board was formed in response to the current need to develop closer and multi-level links among academia and industry. One of its purposes is to help create collaborative projects between the Faculty and the private sector.

Advisory Board members are split into working groups each representing one of the five Faculty departments. The development of these internships stemmed from meetings established by the Mechanical Engineering Working Group composed of representatives from SPAR Aerospace, Pratt & Whitney, Bombardier Inc., Canadair and Rolls Royce Canada. Although SPAR did not participate in the internship program this year, it hopes to create positions for the summer of 1997.

FACULTY NEWS

Centre for Building Studies

Graduate Student Wins Prestigious Award

Ph.D. student **Atul Khanduri** from the Centre for Building Studies placed 1st in the Canadian Society of Civil Engineers' (CSCE) 1996 Graduate Student Research-in-Progress Paper competition. His winning paper entitled *Modelling Wind-Induced Interference Effects* was supervised by thesis supervisors Dr. Ted Stathopoulos and Dr. Claude Bédard from CBS.

Faculty Announcement

Dr. M.N.S. Swamy made Research Professor

At the meeting of Senate held on September 13, 1996, Dr. Frederick Lowy, Rector of Concordia University, announced that he had reached an agreement with Dr. M.N.S. Swamy. In accordance with the agreement, Dr. Swamy has been made a Research Professor in the Department of Electrical Engineering and Computer Science. As such, Dr. Swamy has resumed his research and teaching activities and has been granted office space and access to research facilities. He will also supervise graduate students and conduct research within the Faculty.

Electrical and Computer Engineering

New Faculty Members Join Department

On June 1, 1996 three professors joined the Department as Assistant Professors. **Dr. Yuke Wang** obtained his Ph.D. from the University of Saskatchewan and completed his post-doctoral fellowship at Université de Montréal. His research expertise focuses on VLSI, Protocol Engineering and Digital Signal Processing. **Dr. Sofiène Tahar** received his Ph. D. in Computer Science from the University of Karlsruhe, Germany. He previously worked as research assistant at the University of Karlsruhe, Germany, and as research associate at the Université de Montréal. His research interests include VLSI Design Automation, Hardware Formal Verification, Communications Hardware Systems and Computer Architecture. **Dr. Ferhat Khendek** received his Ph. D. in Computer Science from Université de Montréal in 1995. During his Ph.D studies he was awarded a fellowship from the IBM Center for Advanced Studies. Professor Khendek joins ECE from the Department of Computer Science at Concordia where he acted as Assistant Professor from September 1994 to May 1996.

Mechanical Engineering

Students Nominated in 1996 Gala Énergie Competition

Thanks to the guidance and expertise of Faculty advisors Dr. Taddeus Krepec and Dr. Henry Hong, Concordia's student engineering team was selected as a finalist and placed second in the Gala Énergie 1996 "student project" competition which honours the perseverance and creativity of students responsible for the creation of remarkable projects in the field of energy efficiency. This nomination, sponsored by l'Association québécoise pour la maîtrise de l'énergie and le Ministère des ressources naturelles du Québec, is in recognition of the team's numerous automotive projects over the last three years in the field of energy efficiency. The team was also invited, along with members of Concordia's Chapter of the Society for Automotive Engineers, to a three-day workshop in Detroit, Michigan by the Chrysler Corporation.

Upcoming Seminars in November

The Department of Computer Science will be holding two seminars during the month of November. The first seminar takes place November 4 and features guest speaker **Dr. Jeannette Janssen** from the London School of Economics and Political Science who will be discussing the "Colouring problems related to radio communication". On November 18, **Dr. S.P. Wang** from Northeastern University leads a seminar on "Learning, Representation, Visualization, Understanding and Recognition of 2D Images and Characters". Both events will be held in room LB 922-4 and are scheduled to begin at 10:30 a.m. Coffee and donuts will be served, all are welcome.

Computer Science

Curriculum Restructured

The Department of Computer Science has restructured its undergraduate curriculum for 1996. Students may now choose a Computer Applications option that can be used as the basis of a double major with any other department.

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is a quarterly publication of the Faculty's Communications Office distributed free of charge to the members of the Engineering & Computer Science community.

Composition & Computer Layout:
B. Michael Lennane

BITS welcomes submissions from the members of the Faculty community

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